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Samuel Punshon-Smith*, punshs@brown.edu, Providence, RI. *Chaotic mixing of scalars in stochastic fluid mechanics.*

The long-time behavior of a passive scalar in an incompressible fluid has long been of interest in physics. In this talk I will discuss several recent rigorous results in this area for a passive scalar that is advected by a number of stochastic fluid models, including the stochastic Navier-Stokes equations. We will see how tools from theory of random dynamics and the ergodic and hypoelliptic theory for stochastic PDE can be used to show that the associated Lagrangian flow has a positive Lyapunov exponent. I will then discuss how to use this chaos to show that the passive scalar almost surely mixes exponentially fast, uniformly in the diffusivity. A phenomenon known in physics as chaotic mixing. (Received January 26, 2020)